LIVERMORE LAB
# REPORT

**A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Aug. 12-16, 2013.**

## NewScientist TO FRACK OR NOT TO FRACK

**Fracking for shale gas could become a boon to the energy market.**

When it comes to planning the nation's energy future, there are a few things to consider: Demand is rising, there are issues with greenhouse gas emissions and renewable technologies aren't quite ready for prime time.

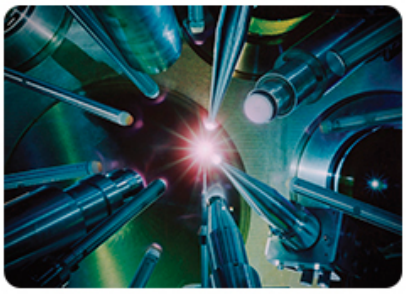
But shale gas could be a stopgap measure. Shale gas is methane trapped in tiny pockets in shale rock formations, sometimes in vast quantities, and forcibly extracted by the process of hydraulic fracturing, or fracking.

Shale gas represents a new source of natural methane gas perfectly placed to displace coal in power stations. In the U.S. it is cheaper than coal. This cheap energy is nothing less than a chance for the U.S. to regain its status as the world's manufacturing and economic powerhouse. Other countries also are getting on the bandwagon.

China is breaking with precedent and calling on Western expertise to help kick-start production, says Julio Friedmann, an energy expert at the Lawrence Livermore National Laboratory

To read more, go to *New Scientist*.

## R&D IT'S SOLID



**In a series of experiments, Lawrence Livermore researchers used the Omega laser system to set a record pressure for solid iron.**

In a series of campaigns led by Lawrence Livermore 's Yuan Ping using the OMEGA laser at the Laboratory for Laser Energetics at the University of Rochester, researchers compressed iron up to 5.6 million atmospheres (5.6 million times the pressure at the Earth's surface), and it remained a solid.

The experiment set a record pressure for solid iron, giving researchers insight into materials' behavior at extreme pressures similar to what occurs during planet formation.

Iron is the most abundant element in Earth's core and the sixth most abundant element in the universe. As a key component of terrestrial planets and exoplanets, iron has become one of the most studied materials under extreme conditions.

The record pressure was achieved by multi-shock compression. Using a series of shocks (rather than a single shock) keeps the entropy low while compressing the material, which is the key to keeping the temperature lower than the melting point and allowing the iron to remain solid.

To read more, go to *R&D Magazine*.

**Ted Ognibene loads a sample in the NEC 1 MV Tandem Accelerator at the Center for Accelerator Mass Spectrometry, which is being used for, among other things, cancer research.**

Livermore researchers have developed a technique using an accelerator-based measurement system that predicts whether some cancerous tumors will respond to a widely used chemotherapy agent.

Patients who don't respond to the drug would be spared the toxic side effects and could go after other therapies.

Using the Lab's Center for Accelerator Mass Spectrometry, researchers used radiocarbon tracing to determine if the chemotherapy agent carboplatin will be effective in treating individuals with bladder and lung cancer.

To read more, go to Physics Today.

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## THE JUMP FROM ANIMALS TO HUMANS

**From left: LLNL scientist Monica Borucki, Jonathan Allen and Haiyin Chen are investigating the link between transmittable viruses jumping from animals to humans.**

Lab researchers have made new discoveries that provide insight into the emergence of inter-species transmittable viruses such as severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome coronavirus (MERS).

The team discovered that the genetic diversity of a viral population within a host animal could allow a virus to adapt to certain conditions, which could help it reach a human host. This discovery advances the scientific understanding of how new viruses produced from animal reservoirs can infect people. An animal reservoir is an animal species that harbors an infectious agent, which then goes on to potentially infect humans or other species.

The team, led by LLNL's Monica Borucki, is investigating viruses related to SARS and MERS, but not the actual viruses themselves.

To read more, go to Red Orbit.

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## FIGHTING OFF THE BAD GUYS


**The DNA Tagged Reagents for Aerosol Experiments can be used to reliably and rapidly diagnose airflow patterns and problems in indoor and outdoor venues**

The Defense Threat Reduction Agency (DTRA) recently lauded Lawrence Livermore for winning five R&D 100 awards, including one award for a project supported by DTRA/U.S. Strategic Command Center for Combating Weapons of Mass Destruction, the outcome of which could provide groundbreaking assistance in fighting bioterrorism.

DTRA facilitated the partnership between the Pentagon Force Protection Agency and LLNL that allowed the protection agency to gain insights into the Pentagon's biological detections systems that were never before achievable.

Using LLNL's safe and versatile material, known as DNA Tagged Reagents for Aerosol Experiments (DNATrax), scientists were able to rapidly and reliably diagnose airflow patterns and problems in indoor and outdoor venues.

To read more, go to Defense Video & Imagery Distribution System.

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LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send e-mail